**Before the**
**FEDERAL COMMUNICATIONS COMMISSION**
**Washington, DC**

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| **In the Matter of** | **)** | |
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| **Response Efforts Undertaken** | **)** | **PS Docket No. 17-344** |
| **During 2017 Hurricane Season** | **)** | |

**COMMENTS OF THE ELEFANTE GROUP, INC.**

The Elefante Group, Inc., (the "Elefante Group"), by its attorneys, hereby provides comments in response to the Public Safety and Homeland Security Bureau's ("Bureau's") December 7, 2017, Public Notice ("Notice") in the above-referenced matter.[1] As discussed herein, stratospheric communications systems operating above almost all weather will prove an essential tool to ensure not only a rapid restoration of service during hurricanes and other severe weather events but will also make significant contributions to maintaining service more successfully *during* such events. The Bureau and Commission should take steps now that facilitate the long-term and, when necessary, the urgent short-term deployment of such communications systems, specifically by designating adequate spectrum to support the communication operations of such systems, to ensure the public has available the benefits such systems will offer, not only during hurricane season, but throughout the year.

## I. BACKGROUND: THE ELEFANTE GROUP AND ITS AIRSHIPS

Elefante Group, a United States corporation founded in 2015, aspires to be the world leader in persistent stratospheric-based communications, sensing, and infrastructure. Drawing on the Lockheed Martin Corporation's ("Lockheed Martin's") decades-long expertise with lighter-than-air platforms, sensing and communications systems, the Elefante Group airship and

[1] Public Notice, Response Efforts Undertaken During 2017 Hurricane Season, DA 17-1180, PS Docket No. 17-344 (rel. Dec. 7, 2017) ("*Notice*").

payloads are being designed, developed, and will be ready for deployment in the next several years. Elefante Group airships, operating at approximately 65,000 feet altitude (less than 20 km) will have a substantial payload-carrying capacity (approximately 1000 kg) to support high-density, high-frequency re-use terrestrial broadband communications and Internet of Things ("IoT") -enabling solutions for the communications, government, institutional, and enterprise sectors.[2]

The Elefante Group and Lockheed Martin (collectively, the "Companies") are refining an innovative communications design that possesses exceptional flexibility and yields superior capacity while maximizing spectrum efficiency and the capability to operate compatibly in frequency bands with a variety of other users.[3] Elefante Group and Lockheed Martin are designing for a total communications throughput of one (1) terabits per second per airship in each direction (on a non-oversubscribed basis) for communications between each airship and user terminals at the time of launch of commercial operations, with plans for future growth.[4] The Companies' airship design offers persistent, spectrally efficient payloads with frequency reuse

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[2] Deployment will require obtaining spectrum access rights and other regulatory approvals. Elefante Group plans to operate in the Fixed Service on a private carrier wholesale basis and will make possible high-speed broadband connectivity to residences and businesses with cost and performance advantages over other solutions; ultra-high capacity broadband connectivity to establish secure private lines and networks for enterprises; wireless carrier direct access or backhaul for connecting small cells to network infrastructure to meet network densification needs of 5G; and IoT-enabling applications combining sensing and communications capabilities for control, location, aggregation, processing and packaging of data across large and/or remote geographic areas to meet the projected growth in IoT devices and increased data usage.

[3] The Elefante Group has detailed its planned systems and approach more fully in several submissions. *See* Letter from Edward A. Yorkgitis, Jr., Kelley Drye & Warren LLP, counsel for Elefante Group, Inc., to Marlene Dortch, Secretary, FCC, Notice of Oral Ex Parte Presentation, GN Docket Nos. 17-183.14-177, IB Docket Nos. 17-95, 15-256, 97-95, and 16-408, RM-11664, and WT Docket No. 10-112 (filed Sep. 8, 2017) ("*September 8 Letter*"); Elefante Group Comments, *In the Matter of Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz*, GN Docket No. 17-183 (filed Oct 2, 2017).

[4] Supporting capacity will be provided by gateways and inter-platform links.

higher than other communications systems, but with the latency and greater link data rates comparable to ground-based systems. The beam sizes, number of beams per airship payload, and ability to customize the footprint relative to satellites will allow the Elefante Group system to target areas of interest with micro precision, while covering a broad area persistently with minimal infrastructure requirements.[5]

The Elefante Group airships will be capable of performing "station-keeping" in a nominally-fixed location. The Elefante group anticipates that this will be the typical mode of operation. However, the airships will also be able to roam or follow patterned routing to surveille/cover a broader area to meet particularized needs.[6] The airships will be capable of adjusting altitude and station keeping to accommodate stratospheric winds (and turbulence) and maintain stability for its payloads. An airship's footprint at station will be up to a 70 km radius for high-capacity communications.

## II. INTRODUCTION: THE ADVANTAGES OF STRATOSPHERIC COMMUNICATIONS SYSTEMS IN RESPONSE TO NATURAL DISASTERS AND EMERGENCIES

[5] To achieve the foregoing capacity objectives, the Companies have been carefully reviewing candidate spectrum bands based on an analysis that considers many factors, including the available equipment component base, atmospheric propagation characteristics, prospects for operational compatibility with incumbent and planned users, and platform and payload size, weight and power ("SWaP") considerations. The Companies are designing for spectral efficiency and compatibility from the outset and are optimizing system architecture to derive additional uses of already encumbered spectrum by maximizing spectrum utilization via re-use, compatibility studies and collaboration with incumbents. The Companies are currently focusing primarily on candidate bands between 21 and 28 GHz as these appear to hold the best promise based on SWaP trades and the nature of other uses to enable efficient low-latency, high capacity communications between user terminals and platforms, but they continue to examine other lower and higher bands as well.

[6] Elefante Group's solar and fuel-cell powered unmanned stratospheric airship is being designed to operate for a minimum of 6 months at an altitude of approximately 19.5 km (65,000 ft) and to maintain a fixed position within 10 km or less or, alternatively, roam at 35-75 knots true airspeed ("KTAS") depending on mission need.

The *Notice* solicits feedback from 2017 hurricane season response participants on "the effectiveness of preparation and response activities for the 2017 hurricane season."[7] The *Notice* also broadly asks if there "[a]re there any actions that the FCC should consider to improve the communications industry response to hurricanes? If so, what would those be?"[8]

Although the Elefante Group, being in the design and development phase, was not in a position to render assistance to restoring communications infrastructure and connectivity during the 2017 hurricane season, it followed with interest some of the restoration performance reporting and noted capability shortfalls.[9] The Elefante Group envisions that the advantages of stratospheric communications solutions, such as the one it is developing, will dramatically improve the resiliency and robustness of the communications infrastructure before, during, and after severe weather events or other natural disasters. Accordingly, the Elefante Group urges the Bureau and the Commission to take steps to promote a regulatory framework that supports the deployment and operation of stratospheric solutions generally, which will promote not only restoration of communications in responses to natural disasters and emergencies but also advance a number of other Commission and Administration objectives.[10]

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7 *Notice* at 1.

8 *Id.*, Question 2B.

9 *See* Susan Ashworth, "How Well Did the FCC Respond to the 2017 Hurricane Season?" Radioworld, Dec 15, 2017, http://www.radioworld.com/news-and-business/0002/how-well-did-the-fcc-respond-to-the-2017-hurricane-season/340910, ("As of press time, for example, the FCC's Disaster Information Reporting System (DIRS) revealed that 21 AM radio stations are still confirmed out of service by the Puerto Rican Broadcast Association, 70 TV stations have been issued Special Temporary Authority to be offline and 17% of cell sites are still out of service, among other statistics"). The FEMA Administrator's written Congressional Testimony on the 2017 Hurricane Season stated demand on its call center volume mushroomed ten-fold. Testimony of Brock Long, FEMA Administrator, before the Senate Committee on Homeland Security and Governmental Affairs, at 3, https://www.dhs.gov/news/2017/10/31/written-testimony-fema-administrator-senate-committee-homeland-security-and.

10 *September 8 Letter* at 4 and Attachment, slide 5 (explaining that permanently deployed Elefante Group platforms will, among other things, also constitute significant investment in high

Persistent stratospheric platforms with large operating footprints would provide an important complement to other restoration methods in the wake of natural disasters and overcome some of the shortcomings of other solutions. Ground-based communications infrastructure possesses limited range with multiple link, wireless and wireline dependencies that are vulnerable to natural disasters, and remain costly to build out and restore. (Restoration of such systems can also be a slow process.) Satellite communications infrastructure sits above the relevant weather, like stratospheric airships, but, despite its other strengths, possesses limits in bandwidth and flexibility. Stations deployed temporarily on traditional aircraft suffer from limited persistence and even more limited capacity, and may have to navigate among numerous response aircraft and in adverse weather. Google Loon's solar- powered, high altitude balloons provided a temporary, limited, and valued service in the wake of Hurricane Maria using an experimental license in conjunction with mobile communications carriers with its design relying on catching favorable winds. Persistent stratospheric communications, like that being pursued by the Elefante Group, however, can offer a valuable and complementary element of a robust and resilient communications infrastructure, including during pre- and post-natural disaster, with its stratospheric airship and its persistent, nominally-fixed, high capacity, high speed, low latency, flexible communications system.

## III. STRATOSPHERIC EMERGENCY RESPONSE APPLICATIONS

Given capabilities like those the Elefante Group is designing for, stratospheric-based communications solutions can significantly improve the resiliency and effectiveness of the

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speed broadband infrastructure, enable innovative broadband solutions in both urban and rural areas to help close the Digital Divide, facilitate densification of existing networks with greater flexibility and lower cost, maximize spectral utilization with significant frequency reuse and operations that can share spectrum compatibly with existing services in the same geographic areas, and create tens of thousands of U.S. jobs in engineering, construction, and operations).

broader communications infrastructure both during preparations for, during the course of, and in response to hurricanes and other natural disasters. The *Notice* asks whether "communications services, such as satellite services, mobile ad-hoc networks, Wi-Fi services, mesh-based communications architectures, experimental projects or other services/technologies [were] used and effective in providing connectivity when other services were limited or down?" and whether "the FCC [should] encourage inclusion of such services in future mitigation plans?"[11] While high altitude balloon communications (Google Loon) were ultimately used in a limited fashion in the wake of and in response to Hurricane Maria on a temporary basis, it is only a small taste of what is possible with the persistent stratospheric airships with far greater communications capacity and station-keeping precision. The Elefante Group recommends that high altitude and stratospheric platform communication services and the connectivity they provide be included in future mitigation plans simply by making them possible on a permanent basis. The need for other short-term mitigations will be reduced and remaining mitigations will themselves be enhanced by ensuring that persistent stratospheric communications can be regularly enabled and deployed, for example through adequate spectrum designations and service rules.

Stratospheric platforms operating at fixed locations can both bolster the communications infrastructure in a way that is significantly weather-resistant and perform other services for multiple customers throughout the emergency or disaster cycle. This is because stratospheric platforms have the added advantage of being able to fly above the storm. With very few exceptions, the atmosphere at 65,000 feet is sufficiently stable to enable operations over and around a hurricane based on discussions with the National Hurricane Center and the National Aviation Weather Center.

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11 *Notice,* Question D6.

Persistent stratospheric solutions will offer an "aerial regional network" and are designed to link one network node to another network node, or link an end user, residential or business, to a network node to another end user. To provide a stratospheric network solution, limited compatible ground network nodes are required. These nodes provide the RF transmit and receive capabilities and serve either as gateways, network terminals or CPE for business and residential customers. Any existing, pre-hurricane customer or network provider that is connected to a stratospheric platform under normal deployment and operations, provided their node has access to either primary or an alternate power and any required gateways, would be able to bypass damaged or missing terrestrial infrastructure. Key disaster-related facilities such as hospital or relief centers, if not already provisioned with the compatible CPE, could have CPE installed pre or post hurricane as it would only need to tie in with the local facility's internal network and only that specific node, in contrast with needing to connect to an entire or reconstituting terrestrial network with its broader power and backup power needs.[12]

Stratospheric platforms can fly in front of the storm providing emergency and complementary communications services under a broad footprint as ground-based communications are adversely impacted.[13] For communications to those in the storm, an Elefante Group payload may have a more limited capability to communicate through thick clouds and moderate to heavy rain. Nevertheless, its commercial 1 Terabit/sec capacity and

[12] The compatible Elefante Group ground terminal will be similar in size to a residential satellite TV dish but with more capacity and higher data rates capable of multiple, real-time video feeds and can serve as a Wifi hotspot for deployments with first responders. The Elefante Group gateways will be approximately three-foot diameter dishes with a partial rack and designed for disaster centers. All Elefante Group power requirements will be similar to existing CPE and equipment could be deployed in emergency response vans.

[13] One (or more) airship(s) could fly in front of the storm providing services while another (or more) follows the storm providing services.

hundreds of spot beams can find areas in the storm and in its proximity to successfully communicate, even if at lower data rates.

Stratospheric airship-based communications can also provide high capacity, low latency broadband services via authorized spectrum to complement and facilitate the reconstitution of the ground-based communications infrastructure. As mentioned above, to provide connectivity for this stratospheric-based network, the Commission and appropriate first responders would deploy compatible gateways and ground terminals to the area and at the appropriate facilities to complement surviving ground infrastructure.

In addition, stratospheric platforms augmented with appropriate sensor equipment can roam and surveille above and in the projected path of the hurricane, in effect "mapping" pre-storm sensor data as they track activity and outages, and providing current sensor data (imagery, radar, RF emissions, etc.) on the status of communications infrastructure within the sensing range of a stratospheric platform during the course of the weather event itself.[14] Such mapping could pinpoint where there are outages as the storm progresses, allowing for more rapid assessments and setting up of ground-based responses. Moreover, stratospheric platforms could be equipped to provide persistent broadcast warnings and emergency communications as terrestrial communications begin failing.

The Bureau also enquires about any challenges faced in terms of back-up power sources for network equipment and asks "are there ways to improve the ability of communications infrastructure to operate when commercial power is lost?"[15] A solar and fuel-cell powered

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[14] An available commercial payload may or may not have an RF scanner or optimized disaster sensors aboard. A stratospheric payload could potentially be equipped to provide information such as visual, radar, emergency beacon, environmental monitoring, and other sensing/monitoring to aid in hurricane recovery.

[15] *Notice*, Question D9.

stratospheric platform can reduce the scope of dependency of a terrestrial communications infrastructure on its local power grid until the infrastructure is adequately restored. These localized infrastructure vulnerabilities and restoration costs multiply across a wide area of coverage comparable to the footprint of a stratospheric-based system. Stratospheric-based solutions, by contrast, particularly with switching capabilities aboard the aircraft to connect two or more users would likely have far fewer pieces of network equipment and infrastructure to power within that wide area.

Finally, the *Notice* asks whether "the market and/or government currently offer sufficient incentives to encourage the build-out and maintenance of resilient communications infrastructure? Are there actions that the FCC should take to encourage industry to build and maintain a resilient communications infrastructure?"[16] In our view, the Commission can support spectrum allocations and rules that enable and incentivize the timely deployment of stratospheric platform communications capabilities with sufficient capacity not only to serve expected market and disaster needs, but also to provide high capacity communications needs as 5G is implemented and IoT is more widely and pervasively deployed. The Commission should encourage stratospheric-based solutions that are good stewards of spectrum resources and are designed and deployed to operate compatibly with other users as well as other stratospheric platform operations in the same geographic area and the same spectrum bands.

## IV. CONCLUSION

For the foregoing reasons, stratospheric-based communications and sensing solutions can be an important part of not only a robust communications infrastructure going forward but also a critical element of this nation's response to major weather events and natural disasters. The

16 *Notice,* Question D11.

Elefante Group airship system, for example, will have the capacity to reliably move relevant data over a broad disaster area to facilitate effective connectivity, awareness and decision-making that saves lives. The Elefante Group looks forward to engaging further with the Public Safety and Homeland Security Bureau to explore how stratospheric communications systems can increase access to reliable communications and awareness services before, during, and after times of emergency.

Respectfully submitted,

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